MACTEC ENVIRONMENTAL RESTORATION SERVICES, LLC

Spectral Gamma-Ray Borehole Log Data Report

Borehole 10-05-02

Log Event A

Borehole Information

Farm : A	**Tank :** A-105	**Site Number :** 299-E25-68
N-Coord : 41,335	**W-Coord :** 47,663	**TOC Elevation :** 687.33
Water Level, ft : 117.50	**Date Drilled :** 5/31/1962	

Casing Record

Type : Steel-welded	Thickness, in. : 0.237	ID, in. : 4
Top Depth, ft. : 0	Bottom Depth, ft. : 121	
Type : Steel-welded	Thickness, in. : 0.280	ID, in. : 6
Top Depth, ft. : 0	Bottom Depth, ft. : 121	

Borehole Notes:

This borehole was originally drilled in May 1962 and completed to a depth of 75 ft with 6-in.-diameter casing. In 1978, the borehole was deepened to a depth of 122 ft. During the borehole extension activities, the 6-in. casing was broken at a depth of about 121 ft. A 4-in. casing was installed to this depth and 90 gal of grout was added to the annulus. An 8-in. casing was temporarily installed to a depth of 16 ft. Twenty-seven gal of grout was added to the annulus between the 6-in. and 8-in. casings and the 8-in. casing was then removed. There is no mention in the driller's log that any of the casings were perforated.

The thicknesses of the 4-in. and 6-in. casings are presumed to be 0.237 in. and 0.280 in., respectively, on the basis of the published thickness for schedule-40, 4-in. and 6-in. steel tubing.

The top of the casing is the zero reference for the log. The casing lip is approximately even with the ground surface.

Equipment Information

Logging System : 1	**Detector Type :** HPGe	**Detector Efficiency:** 35.0 %
Calibration Date : 10/1996	**Calibration Reference :** GJO-HAN-13	**Logging Procedure :** P-GJPO-1783

Logging Information

Log Run Number : 1	**Log Run Date :** 11/08/1996	**Logging Engineer:** Alan Pearson
Start Depth, ft.: 119.0	**Counting Time, sec.:** 100	**L/R :** L **Shield :** N
Finish Depth, ft. : 39.0	**MSA Interval, ft. :** 0.5	**Log Speed, ft/min.:** n/a

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Log Run Number :	2	**Log Run Date :**	11/11/1996	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	0.0	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	40.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Logging Operation Notes:

This borehole was logged in two log runs. The total logging depth achieved by the SGLS was 119 ft. Logging was not performed at a greater depth because water was encountered at 117.5 ft.

Analysis Information

Analyst : S.D. Barry

Data Processing Reference : MAC-VZCP 1.7.9 Analysis Date : 03/12/1998

Analysis Notes :

The pre- and post-survey field verification spectra for all logging runs met the acceptance criteria established for peak shape and system efficiency. The energy calibration and peak-shape calibration from these spectra were used to establish the peak resolution and channel-to-energy parameters used in processing the spectra acquired during the logging operation.

This borehole was completed with 4-in.- and 6-in.-diameter casings along the entire logged interval. Therefore, a casing correction factor for a 0.517-in.-thick steel casing was applied to the concentration data because it matches the total combined thickness of the 4-in. and 6-in. casings. The entire annulus between the 4-in. and 6-in. casings is filled with grout, making accurate radionuclide assays impossible. However, man-made and natural radionuclides were identified and apparent concentrations are reported.

Shape factor analysis was not applied to the SGLS data because of the presence of grout along the entire logged interval.

Log Plot Notes:

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclide concentration plots may not be representative of the formation because of the effects of the grout that was placed between the casings. The headings of the plots identify the specific gamma rays used to calculate the concentrations. Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data. A time-sequence plot of the historical gross gamma log data from 1975 to 1988 is presented with the SGLS log plots.

Results/Interpretations:

The only man-made radionuclide detected in this borehole was Cs-137. Cs-137 contamination was detected

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Log Event A

continuously from the ground surface to 13.5 ft, intermittently just above the MDL from 15 to 55.5 ft, nearly continuously from 90 to 106.5 ft, and at the bottom of the logged interval (119 ft).

The K-40 log plot shows an interval of decreased concentrations from 3 to 12 ft. At 106 ft, the K-40 concentration values increase from about 6 to 8 pCi/g. The Th-232 concentrations also increase at a depth of about 106 ft.

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Report for tank A-105.